thirty-three species are enumerated, to which further search will doubtless add many. Among the Agaricaceæ the following new species are described: *Coprinus sulcatus, C. sulphureus, Hypholoma flocculentum, Agaricus bulbosus, Pluteolus californicus, Pluteus magnus, P. californicus.* Artificial keys to the genera of each order are given, which will doubtless greatly increase the usefulness of the list to collectors in this region. We must again express the conviction that such a catalogue is not the place for the publication of new species, nor for the promulgation of new schemes of classification.— C. R. B.

PROFESSOR WARBURG'S new book on the nutmeg[7] is the result of eight years of study and travel. Already a recognized authority on the Myristicaceæ, and with several years of travel and experience in the land of the nutmeg, it is highly fitting that the author should have undertaken a more general work, appealing not alone to botanists, but to all interested in the history, culture, trade, and commercial value of the myristicas. It was Dr. Warburg who first introduced to science the well-known "long nutmeg" of culture (*M. argentea* Warb.), though for many years it had been familiar to commerce as second only in importance to *M. fragans.* It had long been confused by botanists with *M. fatua*, a species of no particular commercial value, and curiously enough this confusion was not finally cleared up until Dr. Warburg found the plant less than ten years ago in New Guinea and gave an exact diagnosis of the species. Interesting and curious bits of historical and traditional information abound throughout the book. Accounts of the discovery of the Banda Islands, the home of the nutmeg, the gradual spread of its culture from the Indian Archipelago over the tropical world, descriptions of the principal nutmegs of commerce, detailed methods of culture, exhaustive compendium of trade statistics, economic products, etc., constitute the general content of the book. The reviewer is at once impressed with the completeness of the work, and the general scientific style and arrangement. Too many so-called monographs of culture plants have in the past been fragmentary, often compilations of similar worthless publications, constituting a hapless mixture of true and false, conjecture finding place indiscriminately with the well established all thrown together without reference or citation.— E. B. ULINE.

NOTES FOR STUDENTS.

A REPORT on the forests of Western Australia[8] by J. Ednie-Brown, F. L. S., conservator of forests, issued as a government publication, contains a large amount of interesting information about Australian trees. The illustra-

[7] WARBURG, O.: Die Muscatnuss, ihre Geschichte, Botanik, Kultur, Handel und Verwerthung.—Roy. 8vo. 40 Bogen, 3 Heliograv., 4 Lithogr., 1 Kart., 12 Textabbild. Leipzig: Wilhelm Engelmann. *M* 20.

[8] BROWN, J. EDNIE.— Report on the forests of western Australia, their descrip-

tions show forest scenes, especially including views of the greatest of Australian trees, the karri. This tree often exceeds 200 feet in height, with a straight trunk 150 feet to the first branch.— J. C. A.

MUSHROOMS AND THEIR USE was the subject of a series of articles by Mr. Charles H. Peck, the state botanist of New York, that were printed in the *Country Gentleman* during 1894. These have now been republished by permission in pamphlet form by the Cambridge Botanical Supply Co.[9] Mr. Peck is a master of the subject, and this excellent account of the different kinds of edible fungi will be especially helpful to those wishing to know them well enough to safely select edible forms.— J. C. A.

MR. G. C. WHIPPLE observes[10] that the growth of diatoms in ponds is directly connected with circulation of the water due to rising or falling temperature. Diatoms do not develop when the lower layers of water are quiet, but grow best when the water circulates from surface to bottom. In deep ponds this occurs chiefly in spring and fall, while in shallow ones there is no regular autumn period. These convection currents affect the growth because in the two conditions of growth a sufficient supply of nitrates and a free circulation of air are so met. Temperature does not affect growth appreciably, nor the distribution of the diatoms according to the season.— C. R. B.

KLÖCKER AND SCHIÖNNING have reexamined the question as to the origin of Saccharomyces.[11] Numerous observers have endeavored to derive the species of this genus from other forms of fungi, and the list includes some distinguished names. But the last investigators have gone over the question with the utmost thoroughness, endeavoring to exclude all sources of error which they believe have vitiated the conclusions of other students. They summarize their results in a word thus: "There is not a single fact known which indicates that the Saccharomycetes are developmental members of other fungi." They rather speak for their being independent organisms, just as the Exoasceæ, since they have morphologically the same developmental forms as these and no others.— C. R. B.

UPON A STUDY of the path of transportation of the constructive materials in plants, Czapek presented a paper to the Imperial Academy of Sciences at Vienna,[12] in which he concludes: (1) Research by means of resection of

tion, utilization, and proposed future management. Roy. 8vo. Perth, 1896. Pp. 57 30 lith. pl., and 1 col. map.

[9] PECK, CHARLES H.— Mushrooms and their use. Cambridge, Cambr. Bot. Sup. Co., 1897. 8vo. Pp. 80. *figs. 32.* 50 cents.

[10] Technological Quarterly **7**: 214–231. *Cf.* Bot. Cent. **69**: 351. 1897.

[11] Compte rendu des travaux du laboratoire de Carlsberg **4**: —. 1896. [livr. 2]. *Cf.* Bot. Cent. **70**: 88. 1897.

[12] Botanisches Centralblatt **69**: 317. 1897.

plates of tissue from the petiole show that the carbohydrates travel stemwards from the lamina in straight lines. Their path is to be found in the straight leptome strands and not in the parenchyma. (2) Research by girdling, retaining an angular interrupted bridge of cortex, shows that the paths in the leptome itself are straight, and that only the sieve cells and companion cells function in this conduction. The leptome parenchyma, including the pith rays, serve for storage. (3) Dead leptome elements, as well as those narcotized with chloroform are [not][13] capable of conduction. On the contrary, plasmolysis does not interfere with their function. (4) Streaming and continuity of the plasma are not to be considered as real factors in the transportation of material by the leptome, since it occurs normally without them. The real impulse is to be sought in the taking up and giving out of the transported substances by the living protoplasm. (5) The acquisition of independence by parts of a plant so as to form separate individuals is as a rule a reaction due to irritability, released by the stoppage of exchanges with the mother individual.— C. R. B.

THE FUNGI OF ALABAMA have been listed by L. M. Underwood and F. S. Earle in Bulletin no. 80 of the Alabama Experiment Station. The list is a remarkably long one, containing 1110 species. The specimens on which the work is based are all accessible; the few not seen by the authors, chiefly of the Berkeley material at Kew, are so indicated, and the original descriptions of the name are usually given. The list represents one year's indefatigable collecting by the two authors, and the published results of the exploration of Professor Atkinson (1889–92) and Judge Peters (1854–64), with a few other random collections of no considerable amount. There are no descriptions of new species, and few notes or changes of name to interest the systematist, but there are some innovations in the nomenclature of the higher groups, and much historical bibliographical, analytical, and descriptive matter, the latter especially interesting to collectors. The divisions recognized are Class, Order, Family, Genus, and Species. The orders have the uniform ending *ales* (*e. g.*, *Mucorales*, *Uredinales*, and two with abbreviated roots — *Hymeniales* and *Gastrales*), while the families take *aceæ* (*e. g.*, *Phallaceæ*, *Lycoperdaceæ*, *Nidulariaceæ*, and *Hymenogastraceæ* of the order *Gastrales*). As a contribution to the fungous flora of a region of which little has been known, the publication is one of unusual importance.— J. C. A.

THREE ANNUAL REPORTS of Experiment Stations for the year 1896 contain many original data and many valuable observations in vegetable pathology, and in a few other subjects. F. D. Chester (Del. **8**: 35–69) gives the results of numerous experiments in treatment of peach blight and rot with Bordeaux mixture and copper acetate, similar treatment of apple scab and

[13] Omitted by typographical error from the report.

spotting of peaches, and observations on apple and cedar rust. Wm. C. Sturgis (Conn. **20** ; 246–284) in extended trials with corrosive sublimate, lysol, and sulphur for prevention of potato scab, concludes that the first mentioned is the only one that can be recommended. He gives the results of other studies upon this disease as it occurs on potatoes, beets, turnips, mangles, and rutabagas. It does not appear to attack radishes, parsnips, salsify, and carrots. There are also notes upon leaf-blight (physiological) of melons, winter condition of the fungus (*Cladosporium carpophilum* Thm.) causing spotting of peaches, a destructive fungus (*Cercospora Nicotianæ* E. & E.) on tobacco leaves, asparagus rust (*Puccinia Asparagi* DC.), and shelling of grapes (physiological). Geo. E. Stone and R. E. Smith (Mass. **9** : 57–84) describe a sporadic attack of a parasitic bacterium in strawberry plants, various forms of spotting of leaves of decorative plants, an anthracnose of cucumbers (*Colletotrichum Lagenarium* E. & H.), asparagus rust (*Puc. Asparagi* DC,), late rust of blackberry (*Chrysomyxa albida* K.), tomato mildew (*Cladosporium fulvum* Cke.), a chrysanthemum rust (*Puc. Tanaceti* S.), drop and top-burn of lettuce, two diseases due in part to disturbed functions and in part to attack of botrytis, and peculiar meteorological conditions causing the wilting and death of maple leaves.— J. C. A.

METHODS OF EBONIZING wood have long been known in the arts, but it is only a few years since ebonized tables have been used in botanical laboratories. Professor Dr. Julius Wortmann describes a cheap and effective method of doing this,[14] which he learned from Mr. A. Jörgensen at Copenhagen. Tables treated in this way have now been in use in the bacteriological laboratory of the University of Wisconsin for some months and have given entire satisfaction. As most microscopic preparations can be better made on a black background, and as these ebonized tables are very resistant to acids and stains, it is probable that they will come to be extensively used when their merits are known. The following directions will enable anyone to prepare them.

Two solutions are needed. Wortmann (l. c.) gives the following receipts for them :

I. 100^{gm} copper sulphate ; 50^{gm} potassium chlorate ; 615^{gm} water.

II. 100^{gm} anilin chlorate ; 40^{gm} ammonium chloride ; 615^{gm} water, or :

I. 67^{gm} sodium chlorate ; 67^{gm} copper chloride ; 1^{l} water.

II. 150^{gm} anilin chlorate ; 1^{l} water.

The solutions used in the University of Wisconsin are somewhat different from either, though in effect the same :

I. 125^{gm} copper sulphate ; 125^{gm} potassium chlorate ; water to make 1 liter.

II. 60^{gm} anilin oil ; 90^{cc} hydrochloric acid (c. p.); water to make 500^{cc}.

[14] Bot. Zeitung, 54^{2} : 326. 1 N 1897.

Whichever pair is used, the treatment is essentially the same. The wood is to be painted first with solution I, which is allowed to become just dry; then solution II is applied and allowed to dry in. The process is then repeated. A third application may be necessary to obtain the complete blackening desired. The surface should then be washed with lukewarm water to remove any superfluous salts. After drying, the surface may be finished in oil as untreated wood. When complete it should be a smooth dead black with only the polish due to rubbing.—C. R. B.

IN THE *Botanisches Centralblatt* **69**: 277, 1897, is found an abstract of a Russian paper by Chmilewskij, without citation as to its place of publication, giving an account of researches on the structure and multiplication of pyrenoids in algæ which is worthy of notice. Chmilewskij studied particularly the large pyrenoids of Zygnema. Contrary to Schmitz, he finds, by an examination of sections of the pyrenoid, that the granules of the starch jacket are not separated by chromatophoric substance from the pyrenoid, but that they lie directly against it, fine plates of pyrenoid substance extending out between them, so that the pyrenoid is stellate. In spite of the smallness of the pyrenoids in several other algæ (Spirogyra, Cladophora, Œdogonium, and many Protococcaceæ) he was able to establish the same structure. In Zygnema he ascertained, by a study of living as well as of fixed material, that division of the cell generally precedes that of the chromatophores and pyrenoids, each daughter cell having at first a single chromatophore and pyrenoid, which later undergo direct division. In Spirogyra about dusk, and before the nocturnal cell division, the pyrenoids divide, each forming two or sometimes three or four, often of unequal size. Following this occurs the splitting of the plasma filaments which radiate from the nuclear region and are attached to the peripheral plasma beneath the pyrenoids. This is the reverse of the statement of Strasburger, who states that the pyrenoids are formed where the filaments are attached. In different species of Spirogyra the author determined that in the zygotes the pyrenoids of the female cell persist and can be recognized at any time. No ground for belief in the formation of pyrenoids *de novo* was found. Researches on other algæ are in progress.—C. R. B.

RECENT BULLETINS from the experiment stations of interest to botanists are as follows: H. H. Lamson (N. H. no. 45, pp. 45–56) gives results of use of Bordeaux mixture for apple scab and potato blight, and of corrosive sublimate for potato scab. B. D. Halsted (N. J. no. 120, pp. 3–19) has continued his trials of fungicides for potato scab and for soil rot of sweet potatoes and finds sulphur superior for both. He presents considerable original data. J. C. Arthur (Ind. no. 65, pp. 19–36) reports the successful use of formalin for potato scab. He also gives a method for careful percentage determination of the injury in a crop from scab. S. A. Beach (N. Y. no. 117, pp. 132–141) reports the result of work during 1896 in treatment of leaf spot of plum and cherry with Bordeaux mixture. F. C. Stewart (N. Y. no. 119, pp. 154–182) presents a comprehensive account of the downy mildew of the cucumber (*Plasmopara Cubensis* (B. & C.) Humph.), especially of its destructive appearance during 1896 upon Long Island, and of a successful treatment with Bordeaux mixture. A. D. Selby (Ohio no. 79, pp. 97–141) writes about a large number of fungous diseases of orchard and garden crops, and also presents a spray calendar as supplement to the bulletin. J. W. Toumey (Ariz. no. 22, pp. 3–32) gives much good advice regarding weeds, and some account of thirteen of the worst weeds of Arizona. H. L. Bolley (N. D., no. 27, pp. 109–164) reports numerous experiments and studies on the smuts of wheat, oats, and barley, extending over a period of three years, and embracing structural and developmental studies, use of hot water, corrosive sublimate, formalin, potassium sulphide, sulphur dioxide, and other treatments, with many practical and technical discussions. G. P. Clinton (Ill. no. 47, pp. 373–412) writes upon broom corn smut, *Ustilago Sorghi*, or, according to the author, *Cintractia Sorghi-vulgaris* (Tul.) Clint. Among the topics studied were the germination of the spores, growth of the smut, infection, successful hot water treatment, together with historical and bibliographical notes. A. D. Selby and J. F. Hickman (Ohio, no. 78, pp. 92–96) give some observations and a general account of corn smut, *Ustilago Zeæ*. F. D. Chester (Del., no. 34, pp. 3–22) records the results of the use of fungicides during the year 1896, especially in use of Bordeaux mixture for peach rot and apple scab, and of sulphur for diseases of potato tubers. L. R. Jones and W. A. Orton (Vt., no. 56, pp. 3–15) give an excellent summary of the distribution and history of the orange hawkweed (*Hieracium aurantiacum*) with practical suggestions. L. H. Pammel (Iowa, no. 34, pp. 656–686) writes about some troublesome weeds of the mustard family. Fred W. Card (Neb., no. 48, pp. 69–96) has studied windbreaks in a scientific manner, and records their effects upon soil moisture, soil evaporation, air conditions, and the growth of adjoining plants.—J. C. A.

A NUMBER of papers of ecological and geographical interest have recently appeared in Scandinavian publications. One of the more important is by Erikson, on the sand flora of the east coast of Scania in southern Sweden.[15] The sand vegetation is of three types: strand, dune, sandy field; the strand and dune floras are characterized by halophytes, the sandy fields by grasses. The plants exhibit the usual xerophyte adaptations, such as annual habit, abundant pubescence, rosette, and espalier forms, deep and often fleshy roots, well-developed underground stems, thick epidermal walls, isolateral assimilatory tissue, thickening of outer root tissues. Ryan and Hagen have made

[15] Bihang till Kongl. Svensk. Vet. Akad. Handl. **22**. No. 3. 77 pp. Stockholm, 1896. See Bot. Cent. Bei. **6**: 512–515.

a study of the mosses in the neighborhood of Smaalen, Norway.[16] Mosses and other cryptogams are too often omitted or insufficiently considered in geographic studies. In this paper are described the various ecological factors, the different moss floras and their associations with varying soil conditions; the mosses are also separated into climatic groups. The prevailing rocks are granite, gneiss, and porphyry, the latter especially having a peculiar moss flora, largely conditioned by the calcareous nature of the porphyry. Grevillius has studied the vegetation of Jerutland near the boundary of Norway and Sweden.[17] The author has made a study of the plant societies on the various rock types, such as aluminous shales, mica slate, limestone, quartzyte, sandstone and granite. The vegetation varies but little as the rock varies. The predominant vegetation throughout is the spruce forest with abundance of mosses and some birches. Such differences as appear where the rocks vary seem to be due largely to the differences in weathering, characteristic of the rock types. Sernander and Kjellmark describe the results of a peat moor study in the Swedish province of Nerike.[18] This study was prompted by the discovery of two northern species of Betula in the moors of Nerike. The paleontological evidence shows that the former flora of the region was driven out by an invasion of northern types, the invasion being due to increasing severity of climate. A return of more genial conditions resulted in the retreat of the northern forms; the species of Betula now present are taken to be relicts of this northern invasion. Nilsson has described coniferous forests in Sweden that have an abundant herbaceous vegetation.[19] Most coniferous forests in Sweden have the soil covered by mosses or lichens; in some cases grasses occur, but herbaceous forests have seldom been noted. The author describes woods in which there is an abundance of perennial herbs, grasses and mosses. Such woods are supposed to have arisen by gradual transitions from alder swamps in which herbs are abundant; it seems likely that the herbs are destined to disappear and that the ordinary mossy forest is the ultimate destiny. The author closes with a survey of the factors influencing the succession of plant societies; one of the chief causes is the constant change of soil that results from plant life. Each species transforms the soil into a substratum that is disadvantageous to itself. Wittrock has made a study of the higher epiphytic vegetation of Sweden.[20]

[16] Det Kgl. Norske Videnskabernes Selskabs Skrifter. No. 1, pp. 1–168. 1896. See Bot. Cent. **69**: 142–144.

[17] Sveriges Geologiska Undersökning. Series C, No. 144. 4to. 16 pp. Stockholm, 1895. See Bot. Cent. **69**: 289–290.

[18] Bull. Geol. Inst. Upsala, **2**: No. 4. 28 pp. 1895. See Bot. Cent. Bei. **6**: 517–519.

[19] Tidskrift för Skogshushållning, pp. 193–209. Stockholm, 1896. See Bot. Cent. Bei. **6**: 515–517.

[20] Acta Horti Bergiani, Band II, Heft 6, 29 pp. Stockholm, 1896. See Bot. Cent. **69**: 288–289.

The author includes only those forms that occur commonly in the soil but are occasionally epiphytic. Six ferns and ninety-seven seed plants are noted. These epiphytes occur most commonly where the trunk branches or near the base. Trees and shrubs are more common than herbs, *Sorbus Aucuparia* being by far the most abundant form. These epiphytes must be adapted to endure a large amount of shade and considerable drouth, and must also be able to take root and grow in shallow soil. Seeds are conveyed to the place of germination by birds, winds, and mechanical fruit contrivances. Plants with heavy seeds are not epiphytic. In connection with studies by Scandinavian botanists there may be noted a paper by Rabot on the limits in altitude of the forests of northern Scandinavia.[21] The country is well fitted for a comparative study of horizontal and vertical forest limits. The maximum heights, of course, decrease northward, but with considerable irregularity, and are not proportional to the latitude. Proximity to the sea is an important factor, the northward decrease being much greater inland than near the coast. Trees ascend considerably higher on a broken mountain chain than on a plateau. The northern limits of the pine, and also the vertical limits on the mountains, have retreated considerably during the past 150 years. Rabot's studies were extended into Russian Lapland.—H. C. C.

[21] Rev. Gen. Bot. **8**: 385–417. 1896.